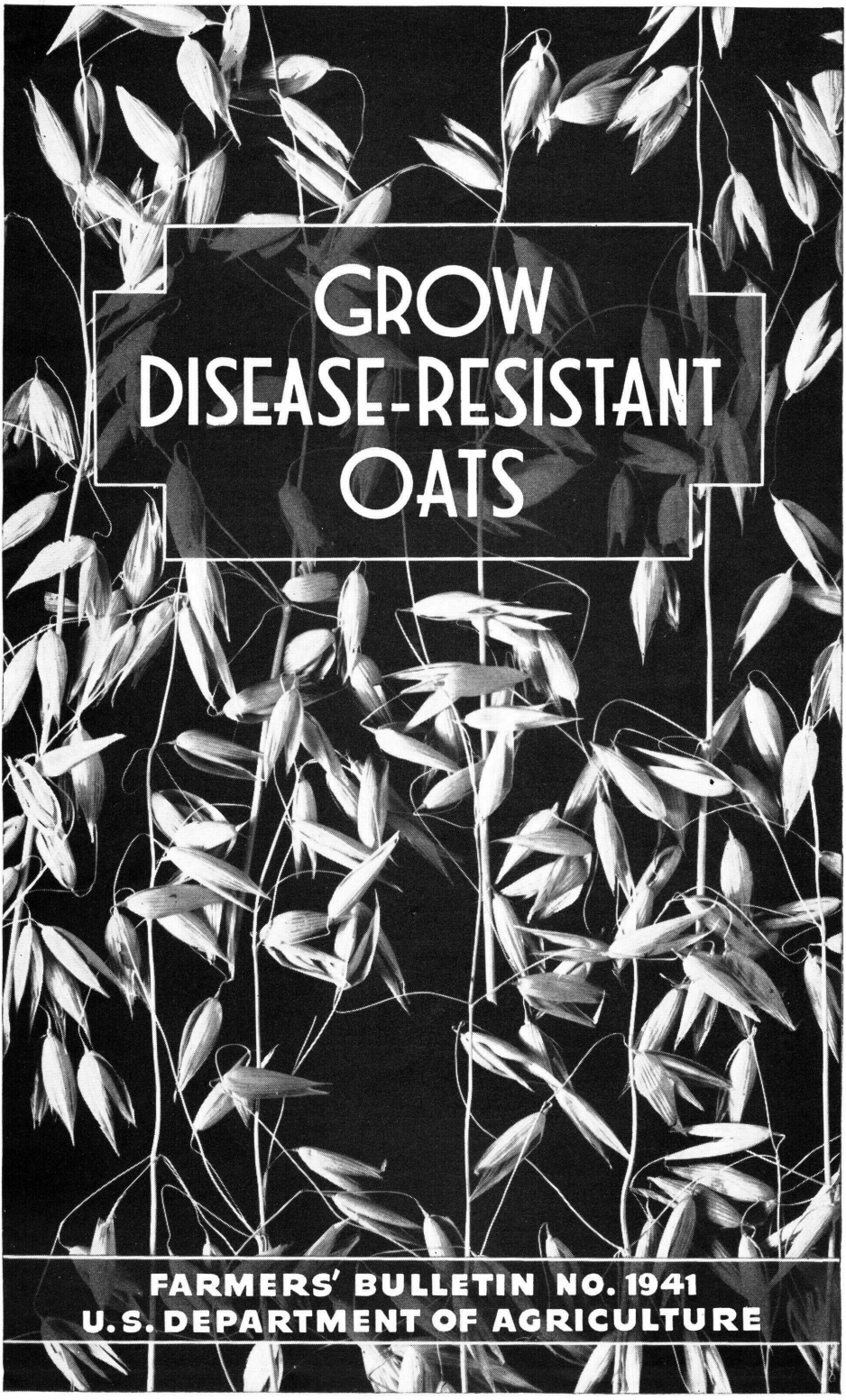


FARMERS' BULLETIN NO. 1941
U.S. DEPARTMENT OF AGRICULTURE

Grow Disease-Resistant Oats

Produce More Oats on Fewer Acres

Make Oats a More Certain Crop

Bond-Related Varieties

Advance	**Andrew**	**Benton**
Bonda	**Bonham**	**Cherokee**
Clinton	**Colo**	**Eaton**
Kent	**Mindo**	**Mohawk**
Nemaha	**Shelby**	**Zephyr**

Other Varieties

Ajax	**Beaver**	**Marion**

Advantages

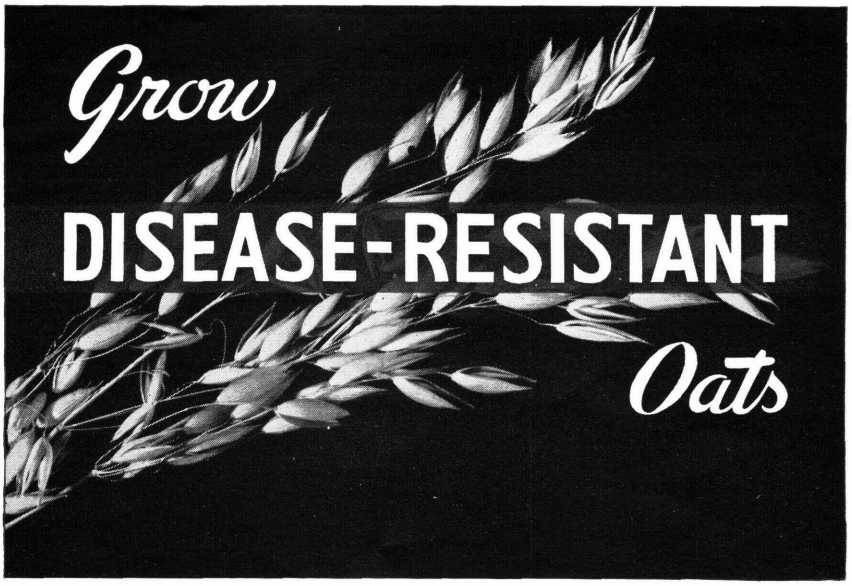
Resistant to Victoria blight
Resistant to certain races of the oat rusts and smuts
Superior yielding ability
Very high test weight
Early to midseason maturity
Stiffer straw, more suitable for growing on rich soils
Suitable for combine harvesting

Good Cultural Methods Pay Big Dividends

Prepare seedbed well
Apply fertilizers and manures where necessary
Seed early
Clean and treat seed
Use certified seed
Sow 8 to 10 pecks to the acre
Sow with drill

Washington, D. C.

Issued October 1943
Revised August 1949



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Contents

NEW VARIETIES OF OATS RESISTANT TO VICTORIA BLIGHT

A new disease of oats known as Victoria blight, or helminthosporium blight,[1] appeared suddenly in epidemic proportions in the North Central States in 1946 and 1947. This disease (fig. 1) caused a drastic reduction in the productiveness and quality of the Boone, Cedar, Control, Tama, Vicland, and Vikota varieties that had been distributed in the early 1940's. The effect of these varieties in increasing oat yields by reducing the losses from the rusts and smuts was very striking. Their culture increased the popularity of oats and raised the economic

[1] *Helminthosporium victoriae* Meehan and Murphy.

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status of the crop. The occurrence of the new blight disease, however, has brought about a rapid shift from the above-named varieties to new blight-resistant varieties that have resulted from crosses with the Bond variety. The latter is a stiff-strawed variety that is resistant to many races of crown (leaf) rust and smut. Bond was introduced from Australia by the United States Department of Agriculture in 1929.

Fortunately, the improvement of oats by crossing on Bond was well advanced by the time Victoria blight was first observed under field conditions in 1945. The Clinton and Benton varieties already had

Figure 1.—Results of Victoria blight: Susceptible variety in middle; resistant variety on either side.

been distributed for increase, and several similar superior strains were ready for increasing when the Victoria blight became widespread and destructive in the Corn Belt in 1946.

By 1947 a total of 13 named varieties of spring oats selected from Bond crosses had been tested in extensive trials for disease resistance, yield, and quality.

Distribution of New Varieties

Of these, Clinton was distributed by the Iowa, Indiana, and Illinois Agricultural Experiment Stations, and Benton by the Indiana and Iowa stations in 1945 (figs. 2, 3, and 4). Mindo and Bonda were released by the Minnesota station, Eaton by the Michigan station, and Colo by a commercial seed company in 1946. Nemaha was first re-

Figure 2.—Clinton oats in Iowa.

Figure 3.—Benton oats in shock in Indiana.

Figure 4.—Clinton oats in shock in Iowa.

leased to farmers by the Nebraska and Kansas stations for seeding in 1948. Bonham, Mohawk, and Cherokee were distributed in 1948 by the agricultural experiment stations in Michigan, New York, and Kansas, respectively. Varieties scheduled for release in 1949 were Shelby, distributed in Iowa and certain other North Central States; Advance, distributed by Cornell (N. Y.) Agricultural Experiment Station; Andrew and Zephyr in Minnesota; and Kent in Michigan.

Origin of Bond-Derived Varieties

Of the 15 varieties named above, Clinton, Benton, Advance, Bonham, Cherokee, Kent, Eaton, Mohawk, Nemaha, Shelby, and Colo all originated from crosses made at the Iowa Agricultural Experiment Station. The first 6 of these 10 varieties were selected from crosses between Iowa D69 and Bond; Eaton from a cross between Iogold and Bond; Mohawk from a cross between Bond and Iowa D67; Nemaha from a double cross between (Victoria-Richland) and (Morota-Bond), Shelby from a cross between Anthony and Bond, and Colo from a Hancock × (Morota-Bond) cross. All of these crosses were made in 1932, except the one giving rise to Nemaha, which was made in 1936. Andrew, Bonda, Mindo, and Zephyr were selected at the Minnesota Agricultural Experiment Station from crosses made in 1931. Andrew originated from a Bond-Rainbow cross; Bonda and Zephyr from a Bond-Anthony cross; and Mindo from a Bond × [(Minota-White Russian) × Black Mesdag] combination.

The hybrid strains that later gave rise to a few of these varieties were distributed to other stations for testing, even before they were purified. Benton, Eaton, and Bonham originated from purification by reselection of some of these strains.

Disease Resistance

All of the varieties listed above are resistant to Victoria blight, to all common physiologic races of crown rust except race 45 and similar races, and to all the common races of stem rust, except Andrew and Eaton, which are susceptible to races 8 and 10. Colo, however, like Marion described below, is moderately resistant to race 45. Likewise, all of these varieties are resistant to many races of the oat smuts. In over-all disease resistance, except for smut, they are superior to any group of varieties yet distributed in the United States (fig. 5).

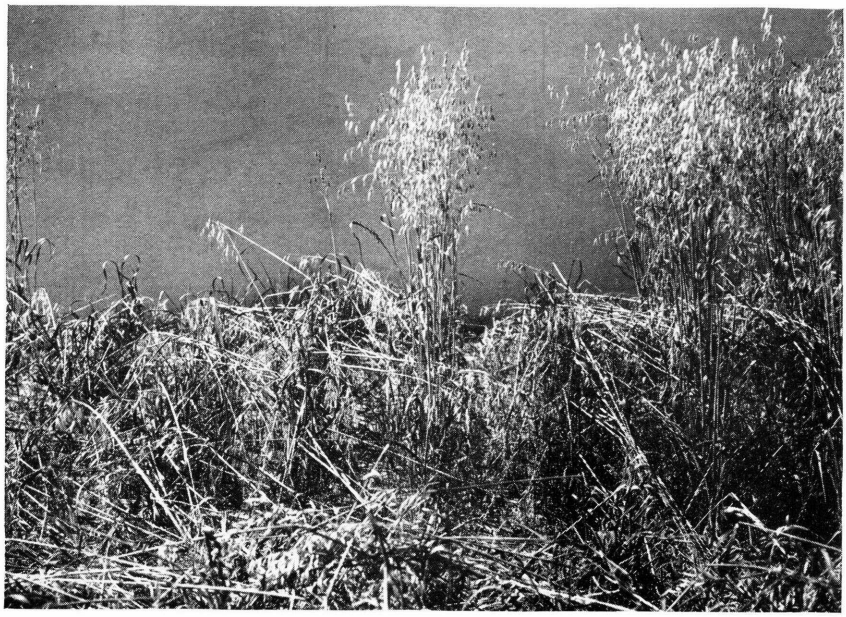

Figure 5.—Rust-resistant strains stand and mature normally; rust-susceptible strains ripen prematurely and lodge. (Oat breeding nursery, Iowa Agricultural Experiment Station.)

Agronomic Characteristics

These new varieties also are superior in yield, quality, and standing ability.

Most of the 15 varieties may be classed as early or early to midseason in maturity. Of the group, Andrew, Mindo, Cherokee, and Nemaha are the earliest and Zephyr the latest. The remaining varieties are more or less intermediate in time of ripening.

All are of medium plant height; Cherokee, Nemaha, and Mindo being the shortest, and Advance and Shelby the tallest. As in the case of time of ripening, the range in plant height of the varieties is rather narrow.

In test weight, all rate as heavy to very heavy, frequently testing 36 pounds or more per bushel. All of these new varieties have stiff to very stiff straw (fig. 6) and plump thin-hulled yellow to yellowish

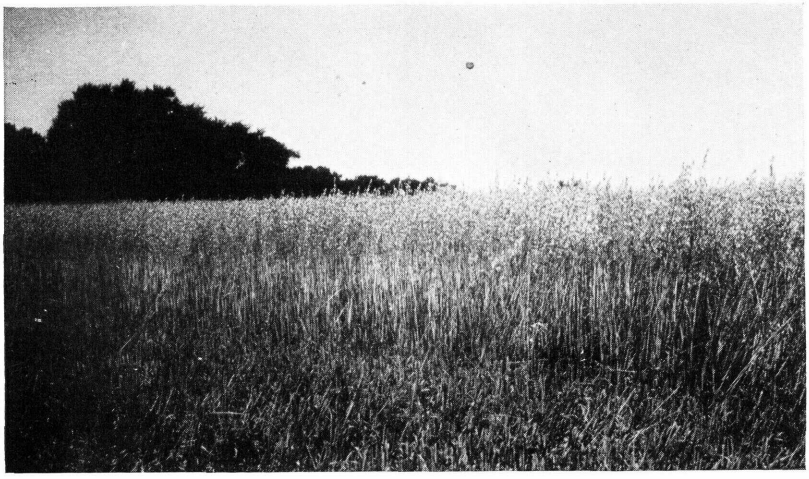

Figure 6.—Field showing excellent standing ability common to the improved varieties derived from Bond crosses.

to ivory-white grains. In quality and standing ability, they surpass any previously grown group of varieties in the Corn Belt (fig. 7).

Most of them produce few or no awns, although Bonda and Zephyr have numerous awns. All are free or nearly free from hairs on the base of the grains.

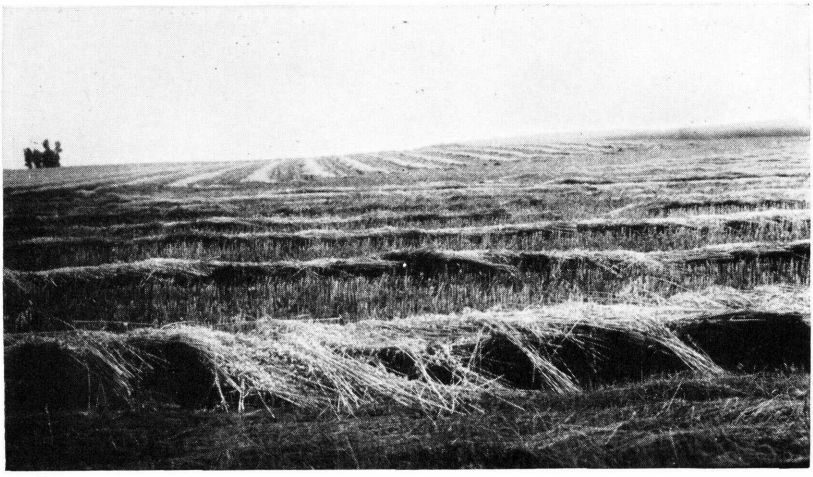

Figure 7.—Windrowed Bonda oats. Stiff stubble holds up oats for curing.

Performance of the New Varieties

During the past 4 years all of these varieties have been tested extensively in plots and nursery rows by the State agricultural experiment stations of the North Central and Northeastern States. They also have been grown widely in special uniform yield test nurseries by the United States Department of Agriculture in cooperation with the State agricultural experiment stations.

The acre yields of these varieties grown in uniform tests in 13 States in the North Central and Northeastern States for the period 1944–47 indicate their superior yielding power. For 1944 and 1945, before Victoria blight became severe, the average yield of Richland

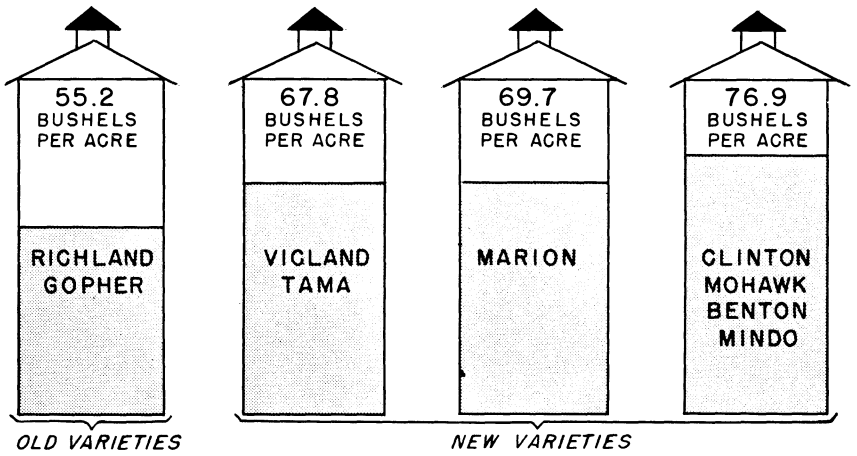

Figure 8.—Vicland and Tama were about as productive as Clinton and other new varieties before blight became severe, but later they yielded even less than the old varieties.

(Iowa 105) and Gopher, 2 old standard varieties, was 55.2 bushels as compared with 67.8 bushels for Vicland and Tama, 69.7 bushels for Marion, and 76.9 bushels for Clinton, Mohawk, Benton, and Mindo. For 1946 and 1947, after Victoria blight became severe, the average acre yields for these same groups of varieties were 64.7, 61.9,

72.3, and 75.1 bushels, respectively. This average performance is illustrated in figure 8.

Other Resistant Varieties

Other improved varieties that should be discussed briefly are Marion, Ajax, and Beaver.

Marion is an early to midseason, midtall (fig. 9), rather distinct type of oats with more slender stems than Clinton. It has almost white grains with thin hulls and large groats. Marion originated from a cross between Markton and Rainbow, made at Arlington Farm in 1928. Markton, a smut-resistant, vigorous variety, very productive in rust-free years, was developed at Moro, Oreg., as a selection

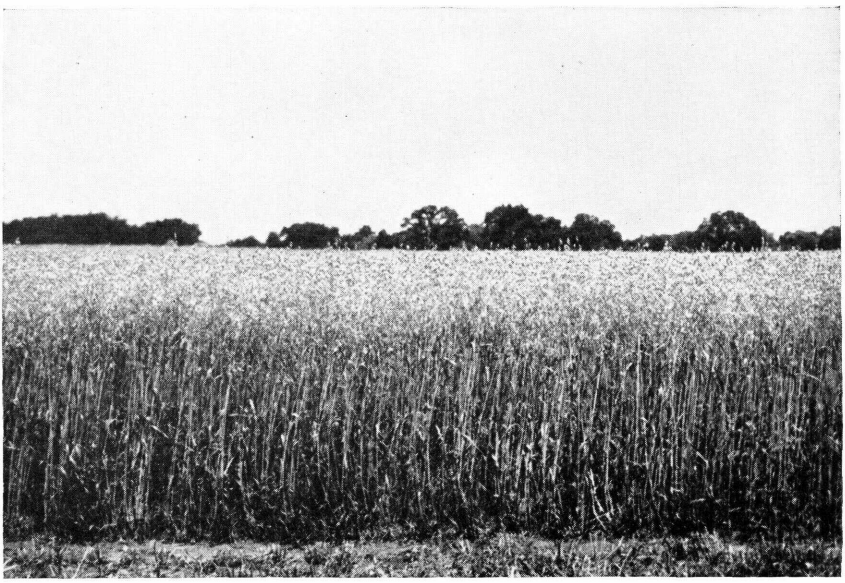

Figure 9.—Marion oats (agronomy farm, Iowa Agricultural Experiment Station).

from an unnamed variety obtained from Turkey in 1903. Markton is very susceptible to both rusts and therefore is not satisfactory for the Corn Belt. Rainbow originated as a selection from Green Russian at the North Dakota Agricultural Experiment Station, at Fargo, and is a very productive variety, resistant to stem rust, except to races 8 and 10. It has only moderate resistance to crown rust. The desirable characters of both Markton and Rainbow, including disease resistance, vigor, high yield, and high quality, have been combined in Marion. The resistance of Marion to Victoria blight has greatly increased the value of the variety since 1946. The principal weaknesses of Marion have been a tendency to lodge when grown on the more productive soils of the Corn Belt and its susceptibility to the new common races 8 and 10 of stem rust. Its moderate resistance to the common races of crown rust has not afforded the protection against this disease comparable with that found in the varieties derived from

Bond crosses, except that Marion also is moderately resistant to race 45 of crown rust that attacks the Bond derivatives.

Ajax was selected from a cross between Victory and Hajira made at the Dominion Laboratory of Cereal Breeding, Winnipeg, Canada, in 1930. The parent Hajira is resistant to many races of stem rust. Ajax is an early to midseason oat with midtall to tall straw and rather short midplump very white grains with numerous awns. It is resistant to the Victoria blight and to many races of stem rust. It is susceptible, however, to races 8 and 10 of stem rust and to the commoner races of crown (leaf) rust and the smuts of oats. In yield tests in the more northern oat areas of the United States, Ajax has been a very productive variety. Owing to its susceptibility to crown rust and smut, however, such varieties as Clinton, Benton, Bonda, and others described herein are preferable because of their better over-all disease resistance.

Beaver is another new Canadian variety that has been less productive than Ajax in certain northern oat areas. It is a midseason white oat with resistance to Victoria blight and many of the common races of stem rust. Beaver unfortunately is susceptible to all of the more common races of crown rust and the oat smuts. Beaver originated from a cross between Vanguard and Erban at the Central Experimental Farms, Ottawa, Canada, where it was recently released for farm production.

These new oat varieties should not be considered in the category of so-called wonder crops, although they are definitely superior in yield to the old standard and, under some conditions, also to the more recently distributed blight-susceptible varieties. They are more productive than the older varieties simply because higher yield, greater stiffness of straw, and resistance to disease, including blight, have been combined in the new varieties.

Oat varieties developed from hybrids do not deteriorate or run out if they are kept free from contamination with seed of other varieties of oats, wheat, barley, and weeds. A farmer may be growing a badly mixed variety and not be fully aware of it, because many oat varieties are somewhat similar and sometimes it is difficult to differentiate similar varieties one from the other. The best insurance of varietal purity is the use of certified seed.

CULTURAL METHODS

Seedbed and Seeding

Oats respond well to good cultural methods. The most desirable seedbed for oats is one that is firm beneath, with a few inches of loose, friable soil on top. It should contain sufficient moisture to insure prompt germination and satisfactory early growth. In most sections of the Corn Belt, where oats usually follow corn, it is as a rule excellent practice to disk the land before seeding (fig. 10), regardless of how the seed is to be sown. Drilling is preferable, although the endgate seeder for sowing oats is still popular on many farms, as less work is required and frequently more timely seeding is possible. Drilling requires less seed, insures sufficient covering, and places the seed at a uniform depth in the soil.

Figure 10.—Preparing seedbed for oats by disking.

Fertilizers and Manure

Although oats respond well to liberal fertilization, it usually is more profitable to apply fertilizer to other crops in the rotation. Under some conditions, however, fertilizers may be applied directly to the oat crop with good results. Frequently, more bushels per acre return per unit of fertilizer can be obtained by applying fertilizer to oats than to wheat or corn. In the Eastern States, oats seldom are injured by excessive nitrogen as they may be on the more productive soils of the Corn Belt or North Central region. The application of too much nitrogen, however, may cause lodging.

Unless the soil is exceedingly low in fertility, the direct application of barnyard manure to oats is rarely advisable. Usually more satisfactory results are obtained by applying manure to some other crop in the rotation, such as corn or potatoes. Under some conditions the oats then will profit by the residual effect of the manure and the added humus in the soil and will be less likely to produce a rank growth that may lodge and reduce grain production. It is safe to apply well-rotted stable manure at the rate of 10 to 15 tons per acre on the poorer soils of these general regions a few months previous to sowing the oats. The use of some phosphate with manure usually is advisable. As a rule, superphosphate is more profitable than rock phosphate for supplementing manure.

The soils of the older eastern area usually are deficient in one or in all of the three most important plant nutrients; that is, nitrogen, phosphorus, or potash. These must be supplied for satisfactory crop production. Phosphorus is most frequently deficient in soils of the eastern area and must be supplied by the application of commercial fertilizer. On the more productive soils of the North Central region the application of nitrogen usually is not necessary but phosphorus may be deficient.

Small quantities of nitrogen fertilizer usually can be used on the oat crop to advantage, especially where neither stable manure nor green manure is available. Potash ordinarily can be supplied more profitably to some other crop in the rotation, such as corn or wheat. Potash

usually is present in sufficient quantities in clay soils, but may be deficient in the more gravelly and sandy soils. It should be supplied in some commercial form to the sandy soils.

Frequently a complete fertilizer—one containing nitrogen, phosphorus, and potash—is used on the oat crops in the eastern region. In recent years there has been a decided increase in the use of complete fertilizers in the North Central region. A good combination on average soils is one containing from 50 to 100 pounds of nitrate of soda or 25 to 50 pounds of ammonium nitrate, 200 to 250 pounds of superphosphate (acid phosphate), and 40 to 80 pounds of muriate or other potash salts, applied 200 to 300 pounds to the acre. On the heavier loam and clay soils potash may be omitted. On farms where some barnyard manure is available the best results with oats ordinarily are obtained by applying 200 to 250 pounds of superphosphate. In any region where the inclusion of soil-building legumes in the rotation provides the nitrogen and potash content of the soil, the application of 150 to 200 pounds of superphosphate usually is one of the most satisfactory fertilizer treatments for oats. The superphosphate should be drilled with the oats at time of seeding. Where oats are grown on land fairly high in nitrogen, lodging may be reduced but not prevented by the application of small quantities of potash and phosphorus, preferably in the form of muriate of potash and superphosphate, respectively. During the past few years excellent results have been obtained in some sections of the Corn Belt from tests in which 200 to 300 pounds of a complete fertilizer containing equal parts of nitrogen, phosphorus, and potash were applied at time of seeding. This treatment has become known as the so-called 8–8–8 formula and is attracting the attention of farmers.

Rate of Seeding

Usually 8 to 10 pecks to the acre is the best seeding rate. The rate may be reduced somewhat if the obtaining of a satisfactory stand of clover and grass with the oats as a companion crop is a major objective.

Early Seeding Usually Insures High Yields

The yield and bushel weight of oats can be increased by sowing early. In cooperative experiments at the Iowa Agricultural Experiment Station, deferred sowing after the optimum date decreased yields approximately 3 bushels per acre for each day of delay. Decreases from delayed sowing have been from one-half to three-fourths bushel for the new Clinton, Benton, and Shelby varieties at the same station. Early seeding always has been good insurance for the production of a satisfactory crop of oats.

Seed Treatment Pays Big Dividends

All oat seed should be cleaned and treated with New Improved Ceresan, Ceresan M, or some other standard fungicide for the control of pythium seed decay and seedling blights, even though the new varieties are resistant to smut. Complete or even partial control of these relatively little understood diseases may result in an increase of some 5 to 10 bushels per acre in certain sections. Cleaning and treating seed oats is always good practice, and it usually pays high dividends. The additional cost involved for treating seed is very low in comparison with the improvement in yield and quality of the ensuing crop.

Regardless of the fact that the new Bond-related varieties described in this bulletin are resistant to many races of the smuts and to other diseases, such as Victoria blight, all seed should be treated before being sown.

Use Seed From Certified Fields

Whenever possible, seed from certified fields should be obtained for sowing. This is especially true of the new disease-resistant varieties. Every farmer should start with pure seed of these varieties, so as to gain the expected advantage from growing them and to be certain that any seed he may distribute to his neighbors in another year will be pure and typical of the variety desired.

HARVESTING THE NEW VARIETIES WITH COMBINES

Before combining, the new varieties of oats described herein should be dead ripe and dry and contain not more than 13 to 14 percent moisture. Otherwise, losses from heating and deterioration of the grain in the bin or other storage may occur. Such deterioration or spoilage not only greatly impairs the value of the oats for feeding or for processing, but also may reduce germination and value for seed.

In such varieties as Clinton, Benton, Bonda, and other Bond-derived oats there is a marked tendency for the straw to remain green for some time after the panicles appear to be ripe. The green stems contain considerable moisture. Thus, in the more humid sections, combining should begin from 10 days to 2 weeks after the oats reach the binder-ripe stage. In hot, dry seasons, this period will be somewhat shorter, whereas in cold, wet seasons it will be longer.

Oats that are windrowed even in the "binder-ripe" stage usually may be picked up and threshed, without danger of spoilage in storage (fig. 11), after they have cured for 2 or 3 days in the windrow. Windrowing requires an extra operation and thus increases cost of production. This, however, assures good grain quality and also protects the crop from losses by storms.

Figure 11.—Picking up and threshing windrowed Clinton oats with a combine in Iowa.

Very weedy fields of oats undoubtedly are harvested more advantageously by windrowing. The weeds, after drying in the windrow, do not interfere with threshing and do not leave green material in the threshed grain to cause heating and consequent impairment of quality.

AVAILABILITY OF SEED

For sources of seed of the new varieties, the oat grower should consult his local county agricultural agent or write to his State agricultural college. Seed stocks of some of these new varieties were sufficiently abundant to sow 60 to 70 percent of the national oat acreage of 1948. Except for a few of the more recently released varieties, there should be ample seed for all growers in the years to follow.

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